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Kashiyama et al.

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(54) **CONNECTOR FITTING STRUCTURE**

(75) Inventors: **Motohisa Kashiyama**, Shizuoka (JP); **Takanori Yamawaki**, Shizuoka (JP)

(73) Assignee: **Yazaki Corporation**, Tokyo (JP)

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(52) **U.S. Cl.** **439/352**; 439/160; 439/489
(58) **Field of Search** 439/352, 159, 439/160, 489

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Primary Examiner—Gary Paumen
Assistant Examiner—James R. Harvey
(74) *Attorney, Agent, or Firm*—Sughrue Mion, PLLC

(57) **ABSTRACT**

In a connector fitting structure, one connector includes an inner housing, having lock arms, and an outer housing having a slider slidably mounted therein. The other connector includes a housing, and engagement projections for abutment against the slider and for respectively elastically deforming the lock arms are formed on this housing. Second retaining portions, which are engageable respectively with first retaining portions formed on the one connector, are formed respectively on engagement arms **16** provided at a second slide member of the slider. Stoppers, which prevent the cancellation of the engagement of the first retaining portions with the second retaining portions before starting the connector fitting operation, are formed on a first slide member of the slider.

7 Claims, 11 Drawing Sheets

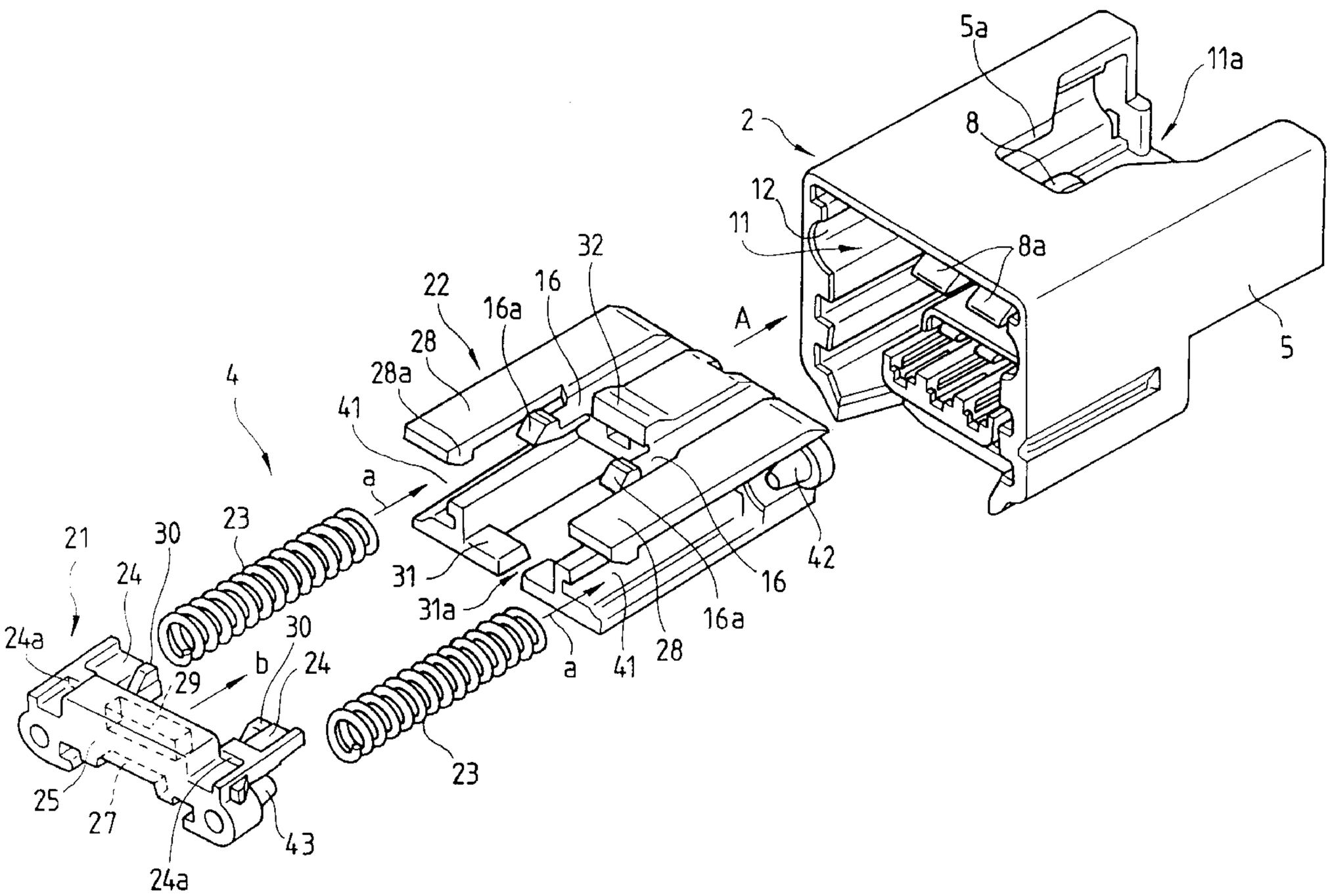
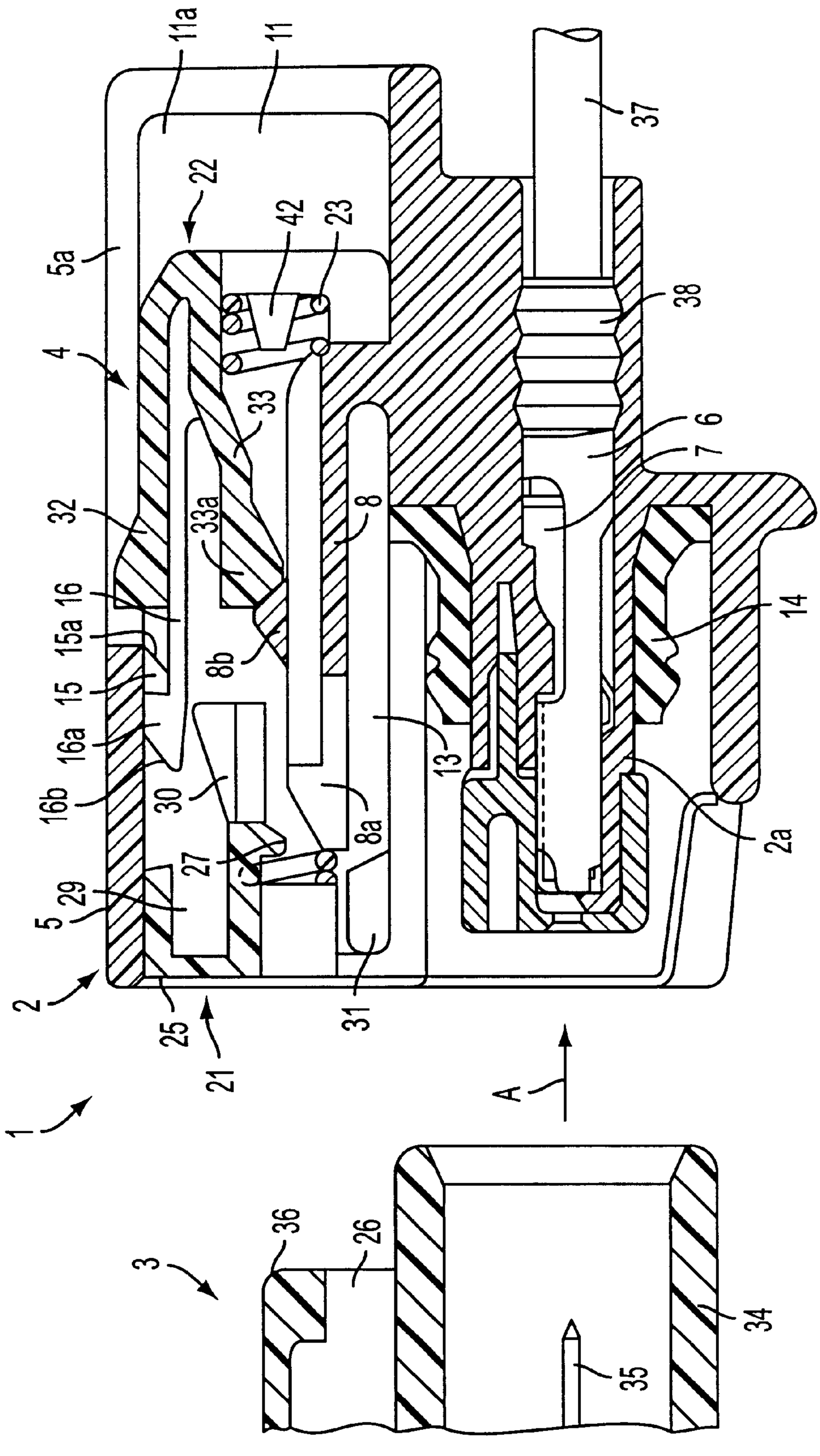


FIG. 1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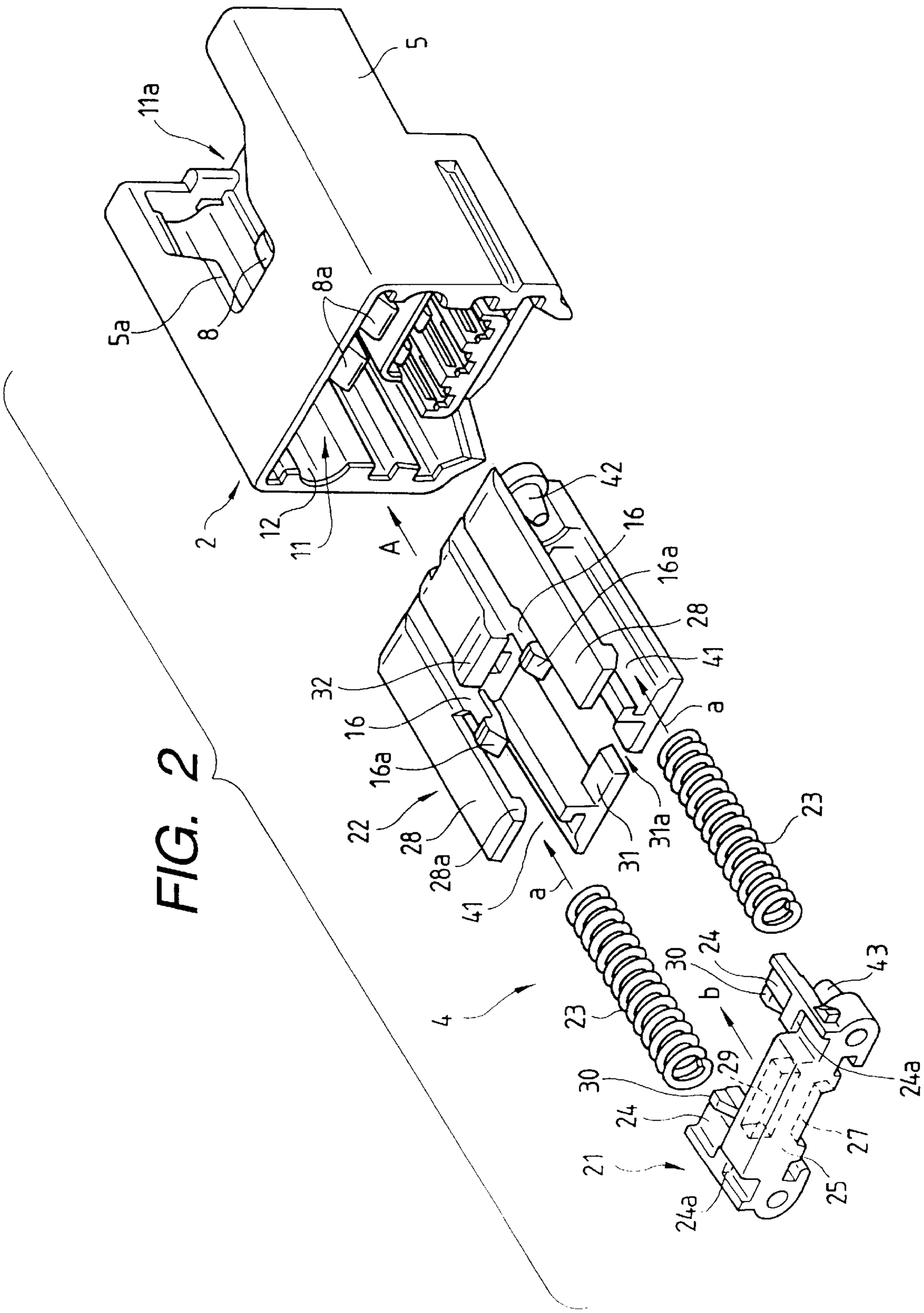
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23
4
30
24
43
b
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24a
21
27
25

FIG. 2

FIG. 3

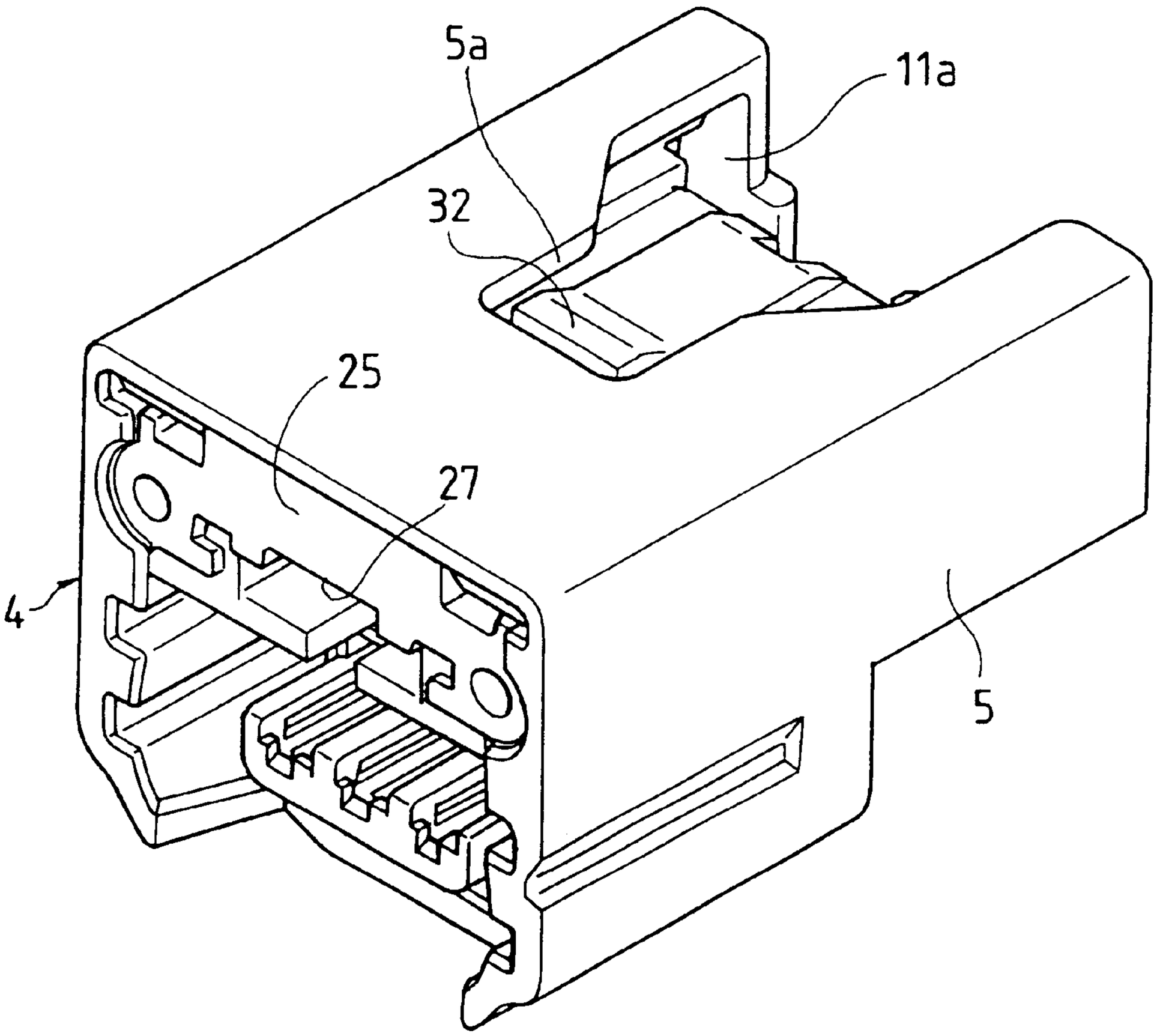
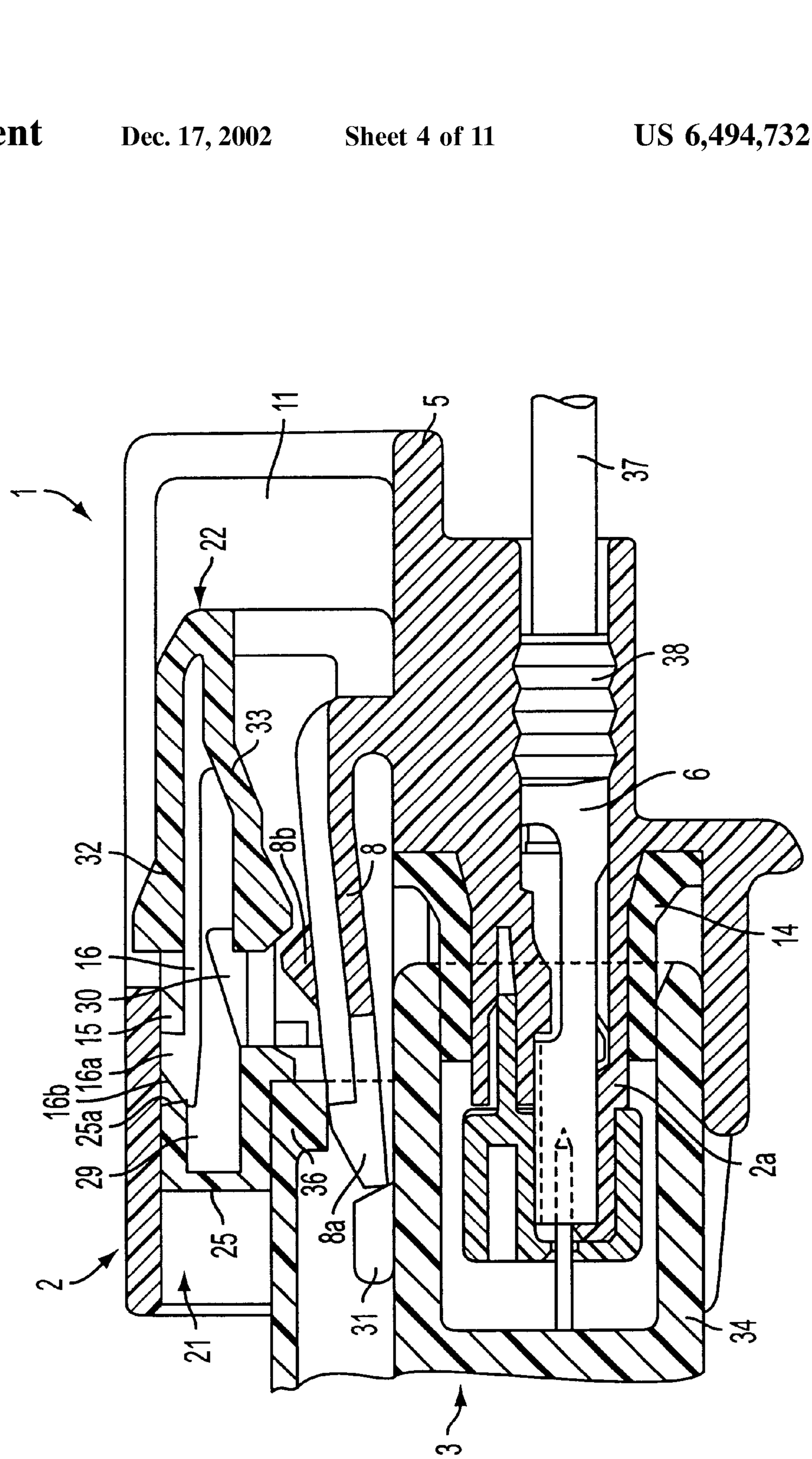


FIG. 4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16b
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2a
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2
31
21
34
3

FIG. 5

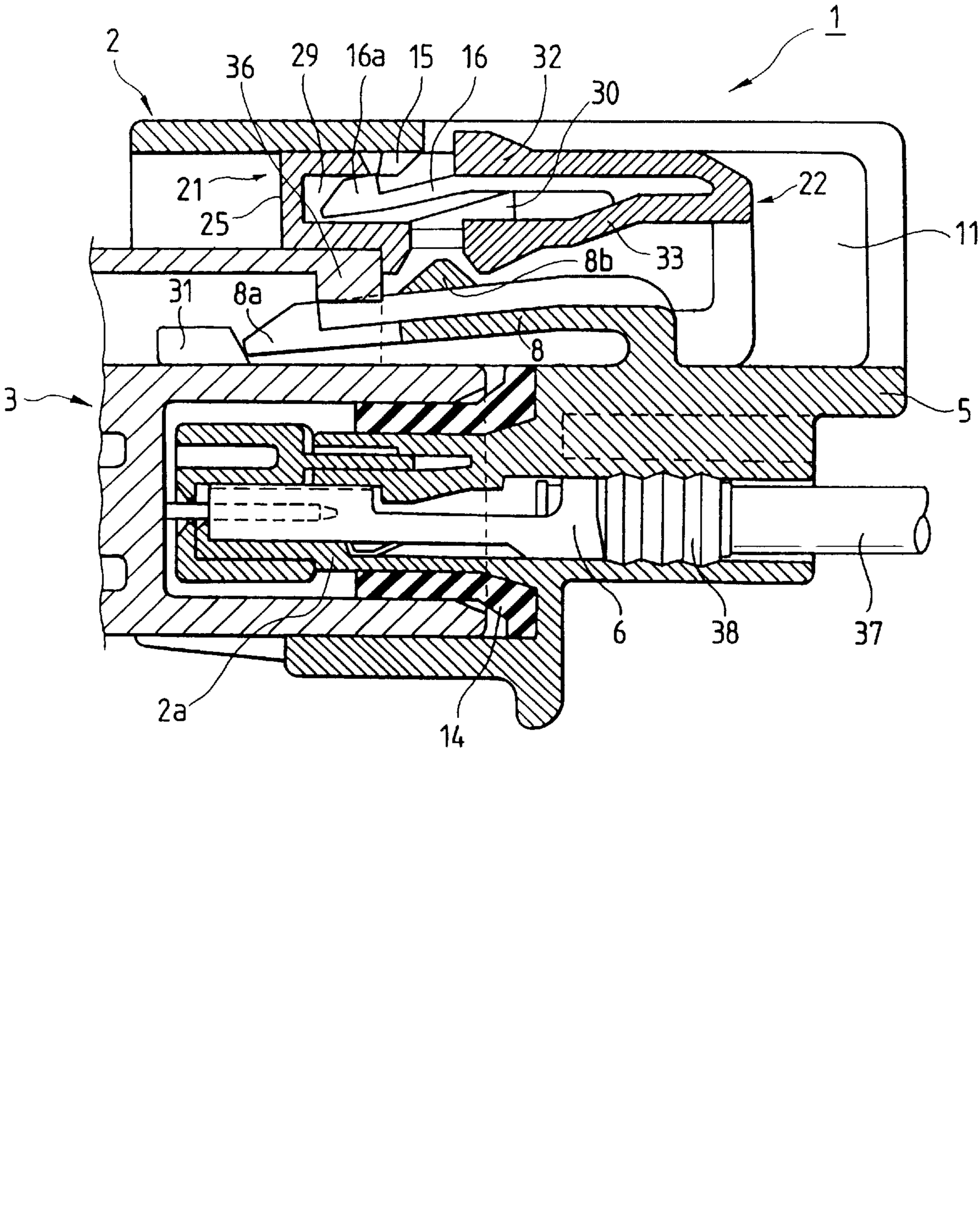
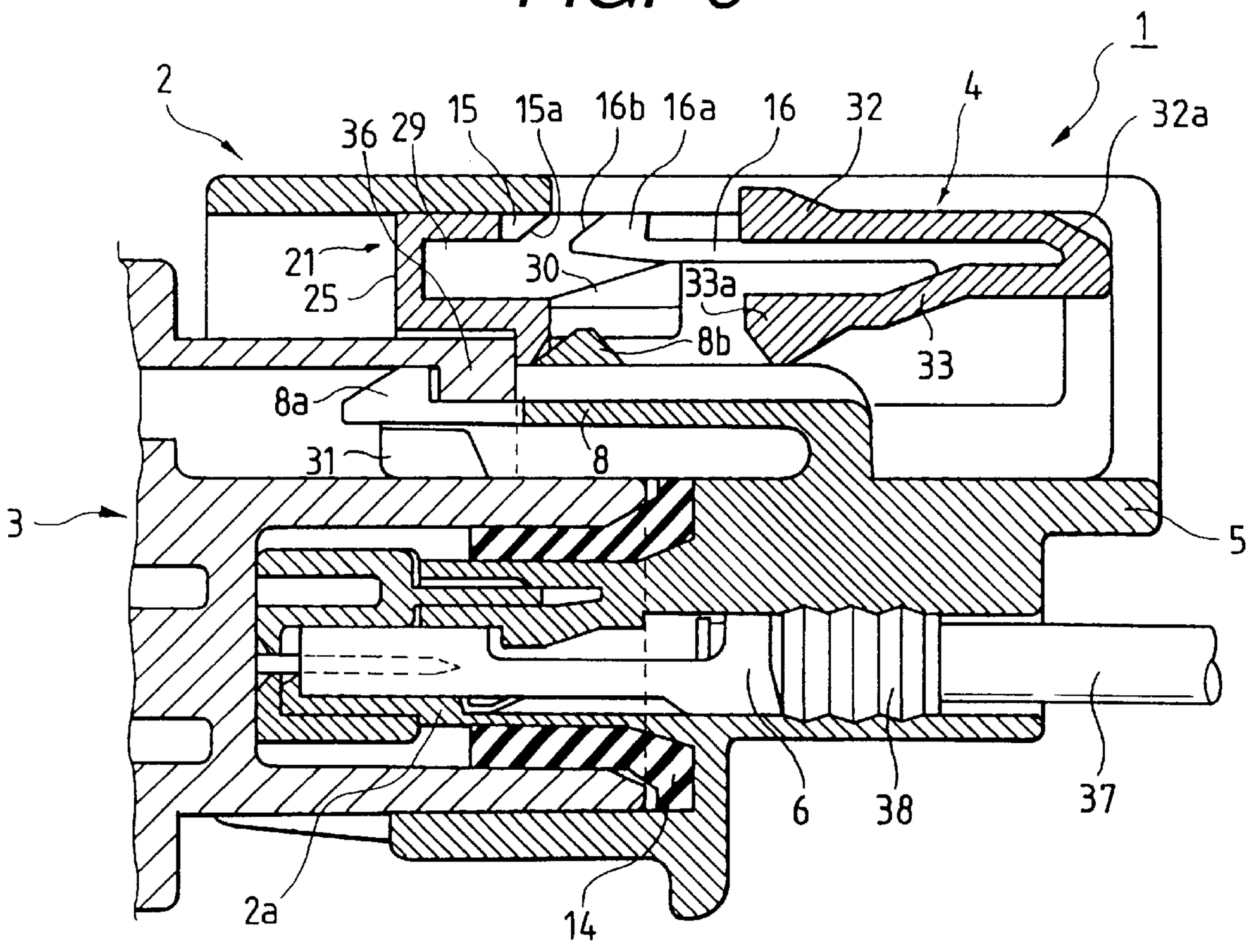


FIG. 6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16b
16a
16
32
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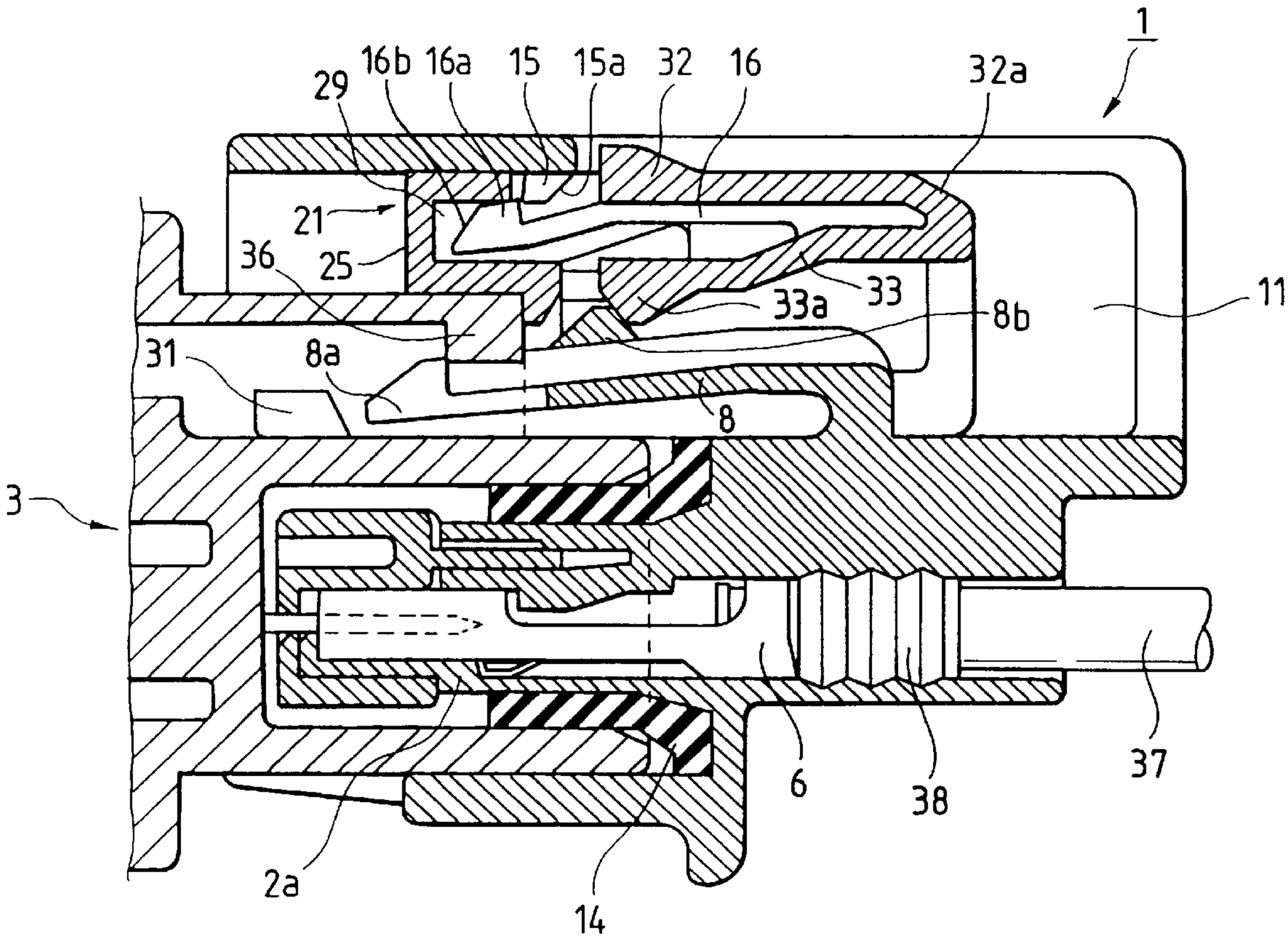
31
8
3
5
6
38
37
2a
14

FIG. 7


1
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15a
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2a
14

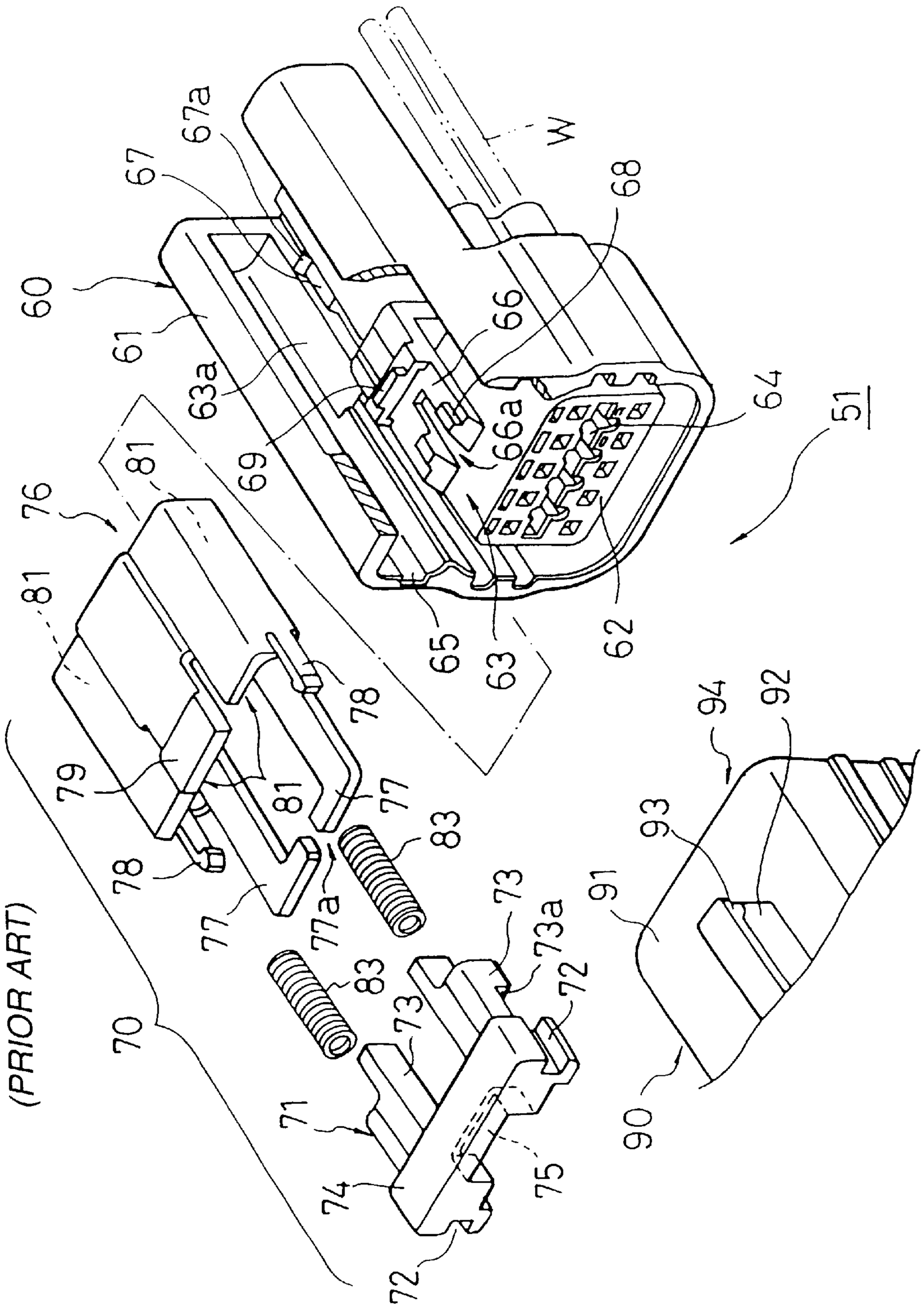

FIG. 8
(PRIOR ART)

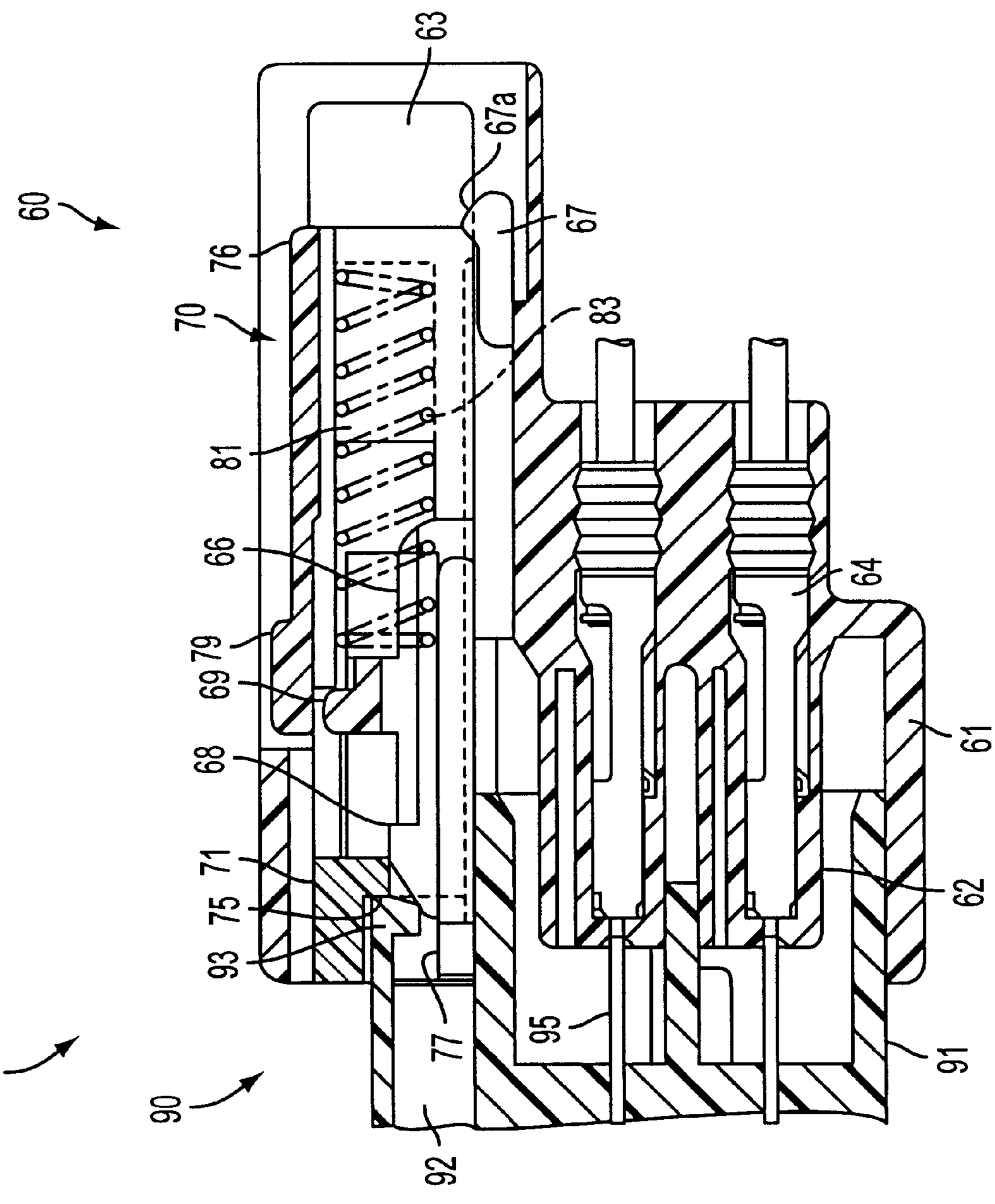

FIG. 9
(PRIOR ART)

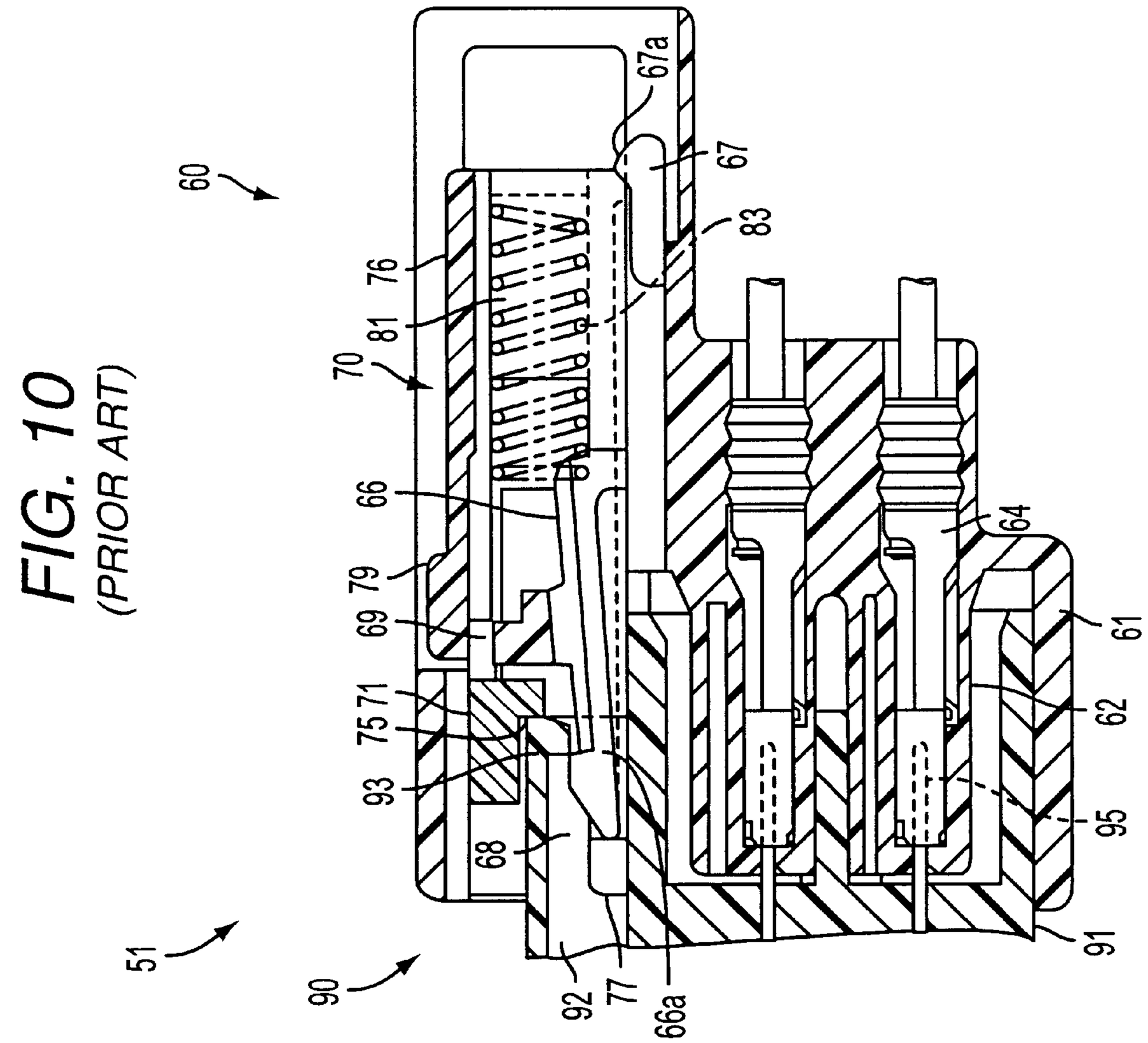

FIG. 10
(PRIOR ART)

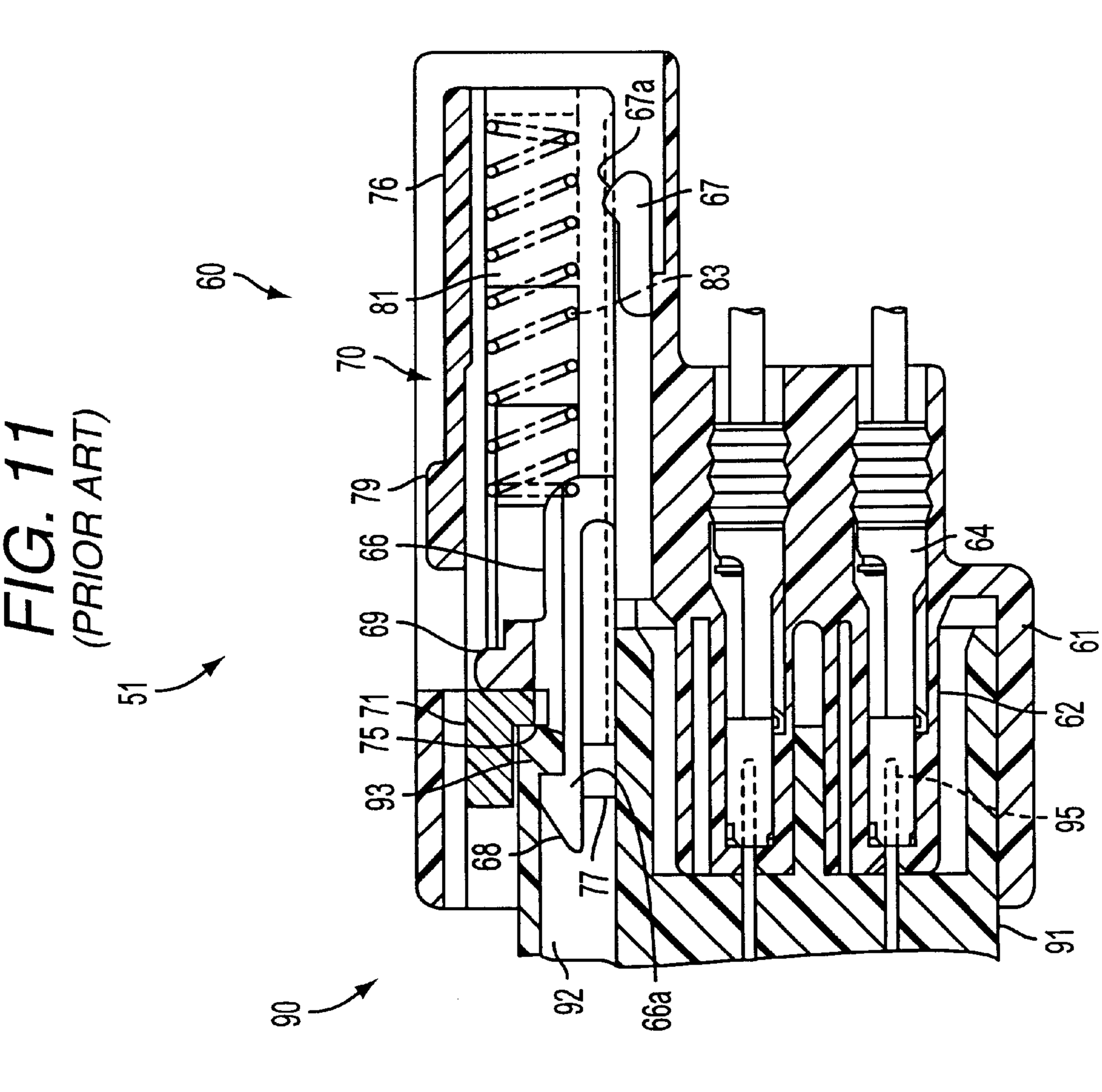

FIG. 11
(PRIOR ART)

CONNECTOR FITTING STRUCTURE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a connector fitting structure in which a pair of male and female connectors are fittingly connected together.

The present application is based on Japanese Patent Application No. 2000-49746, which is incorporated herein by reference.

2. Description of the Related Art

Usually, many electronic equipments are mounted on a vehicle such as an automobile, and various cables for supplying electric power to these equipments and for controlling these equipments, as well as male and female connectors for connecting these cables, have been extensively used. Such male and female connectors have durability and a waterproof function so as to be suitably used in a severe environment, in which vibrations and submergence are encountered, and besides the male and female connectors are so constructed that a wire harness or the like can be easily attached to and detached from the connectors during an assembling process and at the time of maintenance.

One example of conventional connector fitting structures will be described with reference to FIGS. **8** to **11**. As shown in FIG. **8**, a male connector (one connector) **60** of the connector fitting structure **51** includes an inner housing **62**, which has terminal receiving chambers for respectively receiving a predetermined number of socket contacts, and is open to the front side thereof, and an outer housing **61** covering the outer periphery of the inner housing **62**.

The outer housing **61** includes a slider receiving portion **63** for receiving a slider **70**, and guide grooves **65** for respectively guiding opposite side portions of the slider **70** are formed respectively at opposite side portions of the slider receiving portion **63**, that is, in inner surfaces of opposite side walls of the outer housing **61**. Within the slider receiving portion **63**, lock arms **66**, each having a free end (front end in a connector fitting direction), are formed integrally on the inner housing **62**.

A housing lock **68** for retaining engagement with an engagement projection **93** on a female connector (the other connector) **90** is formed on an upper surface of each lock arm **66** at the distal end thereof. An insertion space **66***a* for allowing the insertion of a pressing rib **92** on the female connector **90** is formed between the distal end portions of the lock arms **66**. A pressing portion **69**, which is pressed when canceling the fitting connection, is formed on central portions of the lock arms **66**.

A pair of retaining arms **67** for temporarily preventing the rearward movement of the slider **70** are provided respectively in opposite side spaces **63***a* of the slider receiving portion **63** disposed at a rear portion of the housing in the connector fitting direction.

The slider **70** comprises a first slide member **71**, a second slide member **76** engaged with a rear portion of the first slide member **71**, and compression springs **83** held in the second slide member **76**.

The first slide member **71** includes a pair of rearwardly-extending stopper arm portions **73** and **73**, which are engaged respectively with front ends of the compression springs **83**, and an interconnecting portion **74** interconnecting these arm portions. An abutment portion **75**, against which the pressing rib **92** on the female connector **90**, can abut, is formed at the interconnecting portion **74**. A pair of slide grooves **72** and **72** for allowing the movement of engagement arm portions **78** of the second slide member **76** are formed in opposite ends of the interconnecting portion **74**, respectively.

The second slide member **76** has forwardly-extending retaining portions **77**. The retaining portions **77** can be engaged respectively with the housing locks **68**, formed respectively at the distal ends of the lock arms **66**, during a connector fitting operation. A passage notch **77***a* for allowing the passage of the pressing rib **92** of the female connector **90** is formed between front ends of the retaining portions **77**. An operating portion **79**, which is pressed when canceling the fitting connection, is formed at an upper portion of the second slide member **76** at a widthwise-central portion thereof, and this operating portion **79** covers the pressing portion **69** of the lock arms **66** in overlying relation thereto.

For assembling the slider **70**, the compression springs **83** are inserted respectively into spring receiving chambers **81** in the second slide member **76**, and then the stopper arm portions **73** of the first slide member **71** are inserted into the spring receiving chambers **81**, respectively. The engagement arm portions **78** are engaged respectively with retaining surfaces **73***a* of the stopper arm portions **73**, thereby combining the first and second slide members **71** and **76** together into a unitary form. The slider **70**, thus assembled into a unitary form, is inserted into the male connector **60** from the front side thereof, and is pushed until the rear end of the second slide member **76** is brought into retaining engagement with retaining projections **67***a* of the retaining arms **67**.

The female connector **90** has a housing insertion port **94** open to the front side thereof. The pressing rib **92** for abutment against the abutment portion **75** of the first slide member **71** is formed upright on a housing **91**. The pair of engagement projections **93** for respectively elastically deforming the lock arms **66** are formed respectively on both side surfaces of the pressing rib **92** at the front end thereof.

Next, the operation for fitting the male and female connectors **60** and **90** together will be described.

When the fitting operation is started as shown in FIG. **9**, the pressing rib **92** of the female connector **90** passes through the passage notch **77***a* (see FIG. **8**), and the front end of the pressing rib **92** abuts against the abutment portion **75** of the first slide member **71**.

When the fitting operation further proceeds, the pressing rib **92** of the female connector **90**, while pressing the first slide member **71**, enters the insertion space **66***a* (see FIG. **8**) between the lock arms **66** of the male connector **60**. At this time, the engagement projections **93**, formed at the front end of the pressing rib **92**, are brought into sliding contact with slanting surfaces of the housing locks **68**, formed respectively at the distal ends of the lock arms **66**, respectively, so that the distal end portions of the lock arms **66** are displaced toward the housing **91** of the female connector **90**. As a result, the distal ends of the housing locks **68** are engaged respectively with the retaining portions **77** of the second slide member **76**, thereby preventing the sliding movement of the second slide member **76**, as shown in FIG. **10**.

When the fitting operation further proceeds, the first slide member **71** is pushed by the pressing rib **92**, and therefore is moved rearward. At this time, the engagement arm portions **78** of the second slide member **76** are introduced respectively into the slide grooves **72** (see FIG. **8**) in the first slide member **71**. Thus, the first slide member **71** is moved while the second slide member **76** is stopped, and therefore

the compression springs **83** in the second slide member **76** are compressed, and a restoring force for resiliently restoring the compression spring **83** into its original condition is produced in each compression spring **83**.

If the fitting operation is stopped in a half-fitted condition in which the housing locks **68** of the male connector **60** are not completely engaged respectively with the engagement projections **93** of the female connector **90**, the first slide member **71** is pushed back in a disengaging direction (opposite to the connector fitting direction) by the restoring force of the compression springs **83**. Therefore, the half-fitted condition can be easily detected.

Then, when the fitting operation further proceeds against the bias of the compression springs **83**, the engagement projections **93** of the female connector **90** slide respectively past the housing locks **68** formed respectively at the distal ends of the lock arms **66**, as shown in FIG. **11**. At this time, the lock arms **66** are elastically restored into their original shape. As a result, the engagement of the distal end of each housing lock **68** with the retaining portion **77** is canceled, so that the housing lock **68** is engaged with the rear end of the engagement projection **93**. Namely, the male connector **60** and the female connector **90** are completely fitted together, and contacts **64** in the male connector are completely electrically connected respectively to contacts **95** in the female connector.

For canceling the completely-fitted condition shown in FIG. **11**, the operating portion **79** of the second slide member **76** is pushed back by the finger or other against the bias of the compression springs **83** to a position where this operating portion **79** covers the pressing portion **69** of the lock arms **66**. In this condition, the operating portion **79** is pressed to depress the pressing portion **69**, so that the housing locks **68** of the lock arms **66** are displaced downward (in the drawings). As a result, the engagement of the housing locks **68** with the engagement projections **93** is canceled. At this time, the first slide member **71** is pushed forward by the restoring force of the compressed compression springs **83**. As a result, the female connector **90** is pushed back in the disengaging direction through the pressing rib **92** abutted against the abutment portion **75** of the first slide member **71**.

In the above conventional connector fitting structure **51**, the slider **70** is mounted in the slider receiving portion **63** of the male connector **60**, and in this condition, the restoring force is slightly produced in the compression springs **83** before the fitting operation is started. Therefore, the retainment of the second slide member **76** by the retaining projections **67***a* of the retaining arms **67** was sometimes canceled by vibrations or other developing during the transport of the product, so that the second slide member **76** is moved rearward (right in FIG. **9**) by the resilient force of the compression springs **83**. If the second slide member **76** is thus moved, the second slide member **76** must first be pushed back to its initial position (shown in FIG. **9**) when starting the fitting operation, and therefore the fitting operation is cumbersome.

SUMMARY OF THE INVENTION

The present invention has been made under the above circumstances, and an object of the invention is to provide a connector fitting structure in which a half-fitted condition of a pair of male and female connectors can be positively detected, and besides the fitting operation can be easily carried out.

The above object of the invention has been achieved by a connector fitting structure comprising a first connector having an inner housing opening to a front side thereof, an outer housing covering the inner housing and a lock arm provided on the inner housing;

a second connector fitted and connected to the first connector and having an engagement projection;

a slider comprising, a first slide member for sliding within the connector in a connector fitting direction, a second slide member engaged with a rear portion of the first slide member, and an resilient member for urging the first and second slide members away from each other;

wherein at least one part of the second slide member is engaged with at least one part of the first connector to thereby retain the second slide member in its initial position and a stopper means provided on the fist slide member for preventing the cancellation of the engagement between the parts of the second slide member and the first connector before the connector fitting operation, and

wherein, the engagement projection of the second connector urges the first slider member and deforms elastically the lock arm to thereby prevent tentatively the second slide member from moving, whereby the first slide member is moved relatively to the second slide member and the first connector to thereby unlock the stopper means and disengage the engagement between the parts of the second slide member and the first connector by an abutment of a part of the first connector to the second sliding member in accordance with the connector fitting operation.

In the above connector fitting structure, when the slider is disposed in its initial position where the second retaining portion of the second slide member is retained by the first retaining portion of the one connector before the operation for fitting the male and female connectors together is started, the stopper of the first slide member prevents the cancellation of the engagement of the first retaining portion with the second retaining portion. Therefore, the second slide member can be positively prevented from being moved before starting the fitting operation, and therefore it is not necessary to push the second slide member back to its initial position, and the fitting operation can be carried out easily and rapidly.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a cross-sectional view of one preferred embodiment of a connector fitting structure of the invention, showing a condition before two connectors are fitted together;

FIG. **2** is an exploded, perspective view showing the construction of a slider;

FIG. **3** is a perspective view showing a condition in which the slider is mounted in the male connector;

FIG. **4** is a cross-sectional view, showing a condition in which the fitting of the male and female connectors relative to each other is initiated;

FIG. **5** is a cross-sectional view, showing a half-fitted condition of the male and female connectors;

FIG. **6** is a cross-sectional view, showing a completely-fitted condition of the male and female connectors;

FIG. **7** is a cross-sectional view, showing a process of canceling the fitted condition of the male and female connectors;

FIG. **8** is an exploded, perspective view of a conventional connector fitting structure;

FIG. **9** is a cross-sectional view of the conventional connector fitting structure, showing a condition before a connector fitting operation is started;

FIG. **10** is a cross-sectional view of the connector fitting structure of FIG. **9**, showing a half-fitted condition; and

FIG. **11** is a cross-sectional view of the connector fitting structure of FIG. **9**, showing a completely-fitted condition.

DETAIL DESCRIPTION OF THE PREFERRED EMBODIMENTS

One preferred embodiment of the present invention will now be described in detail with reference to the drawings. FIG. **1** is a cross-sectional view of a connector fitting structure of this embodiment, showing a condition before two connectors are fitted together, FIG. **2** is an exploded, perspective view showing the construction of a slider of the connector fitting structure of FIG. **1**, and FIG. **3** is a perspective view showing a condition in which the slider is mounted in the male connector of FIG. **2**.

FIG. **4** is a cross-sectional view of the connector fitting structure of FIG. **1**, showing a condition in which the fitting of the connectors relative to each other is initiated, FIG. **5** is a cross-sectional view of the connector fitting structure of FIG. **1**, showing a half-fitted condition of the connectors, FIG. **6** is a cross-sectional view of the connector fitting structure of FIG. **1**, showing a completely-fitted condition of the connectors, and FIG. **7** is a cross-sectional view of the connector fitting structure of FIG. **1**, showing a process of canceling the fitted condition of the connectors.

As shown in FIG. **1**, the connector fitting structure **1** comprises the male connector (one connector) **2**, the female connector (the other connector) **3**, and the slider **4**.

The male connector **2** includes an inner housing **2***a*, which has terminal receiving chambers **7** for respectively receiving a predetermined number of socket contacts **6**, and is open to the front side thereof, and a hood-like outer housing **5** covering the inner housing **2***a*. A slider receiving portion **11** is formed between an inner surface of the outer housing **5** and a surface (an upper surface of an upper wall in the drawings) of the inner housing **2***a*. Lock arms **8**, each having a free end (front end in a connector fitting direction), are formed integrally on the upper surface of the inner housing **2***a* in a cantilever manner. A housing lock **8***a* is formed on an upper surface of each lock arm **8** at a distal end thereof. A pressing portion **8***b* is formed on central portions of the lock arms **8**. An insertion space **13** is formed between the lower surfaces of the lock arms **8** and the upper surface of the inner housing **2***a*. A seal member **14** is fitted on the outer periphery of the inner housing **2***a*.

First retaining portions **15**, each in the form of a projection or a hook, are formed on the inner surface (a lower surface of an upper wall in the drawings) of the outer housing **5**. These first retaining portions **15** are engaged with second retaining portions **16***a* of the slider **4** (described later), respectively.

As shown in FIG. **2**, the slider **4** comprises a first slide member **21** for sliding movement in a connector fitting direction within the outer housing **5**, and a second slide member **22** engaged with a rear portion (in the connector fitting direction) of the first slide member **21**. The slider **4** further comprises compression springs (resilient members) **23** and **23** urging the first and second slide members **21** and **22** away from each other.

The first slide member **21** includes a pair of rearwardly-extending stopper arm portions **24** and **24**, and an interconnecting portion **25** interconnecting these stopper arm portions **24** and **24** at front ends (in the connector fitting direction) thereof. An abutment portion **27** is formed at that surface (lower surface in the drawings) of the interconnecting portion **25** which faces the inner housing when the slider is mounted in the outer housing **5**, the abutment portion **27** being disposed immediately adjacent to the front end of the interconnecting portion **25**. A slide groove **29** is formed in the lower surface (in the drawings) of the rear end portion of the interconnecting portion **25**, and this slide groove **29** prevents the second slide member **22** from interfering with the interconnecting portion **25** when the first and second slide members **21** and **22** approach each other during the fitting operation. An auxiliary retaining surface **24***a* is formed on an upper surface (in the drawings) of each stopper arm portion **24**, and a stopper projection (stopper) **30** is formed on the upper surface (in the drawings) of the stopper arm portion **24** at a rear end thereof. A retaining projection **43**, which retains the front end of the compression spring **23**, is formed at a lower portion (in the drawings) of each stopper arm portion **24**.

The second slide member **22** has forwardly-extending retaining portions **31**. The retaining portion **31** can be engaged respectively with the housing locks **8***a* during the connector fitting operation. A passage notch **31***a* is formed between front ends of the retaining portions **31**. An operating portion **32** is formed at that side (upper side in the drawings) of the second slide member **22** which faces an operating notch **5***a* in the outer housing **5** when the slider is mounted in the outer housing **5**. A pair of forwardly-extending auxiliary arms **28** and **28** are formed at the upper side (in the drawings) of the second slide member **22**. An auxiliary retaining projection **28***a* for retaining engagement with the corresponding auxiliary retaining surface **24***a* of the first side member **21** is formed at a distal end of each auxiliary arm **28**.

A pair of forwardly-extending first engagement arms **16** and **16** are formed at the upper side (in the drawings) of the second slide member **22**. The second retaining portion **16***a* in the form of a projection or a hook is formed on an upper surface (in the drawings) of each first engagement arm **16** at a distal end thereof.

The operating notch **5***a* is formed in the upper wall (in the drawings) of the outer housing **5** of the male connector **2**, and the operating portion **32** can be operated from the exterior through this operating notch **5***a*. Guide grooves **12** for respectively guiding opposite side portions of the slider **4** are formed respectively in inner surfaces of opposite side walls of the outer housing **5**. Within the slider receiving portion **11**, a side space **11***a* is formed between each lock arm **8** and the inner surface of the outer housing **5**.

For assembling the slider **4**, the compression springs **23** are inserted respectively into fitting grooves **41**, formed respectively in the opposite side portions of the second slide member **22**, in a direction of arrow a (in the drawings), and one ends of these compression springs **23** are held respectively by retaining projections **42** formed respectively at inner ends of the fitting grooves **41**. In this condition, the first slide member **21** is moved toward the second slide member **22** in a direction of arrow (in the drawings), and the retaining projections **43** of the first slide member **21** are inserted into the other ends of the compression springs **23**, respectively. Then, the auxiliary retaining projections **28** of the second slide member **22** are retainingly engaged respectively with the auxiliary retaining surfaces **24***a* of the first slide member **21**, thereby combining the first and second slide members **21** and **22** together into a unitary form so that the first and second slide members **21** and **22** can move toward and away from each other along the connecting fitting direction.

When the assembled slider **4** is moved in a direction of arrow A (in the drawings), and is inserted into the slider

receiving portion **11** of the male connector **2**, the operating portion **32** is brought into contact with the inner surface of the upper wall of the outer housing **5** to be deformed downwardly (in the drawings), and further slides on this inner surface in this deformed condition. Then, when the operating portion **32** reaches the operating notch **5***a,* this operating portion **32** is elastically restored into its original shape. Therefore, whether or not the slider **4** has been properly mounted in the outer housing can be confirmed from the condition of the operating portion **32**.

When the slider **4** is completely mounted in the outer housing **5** as shown in FIG. **3**, the operating portion **32** is exposed to the exterior through the operating notch **5***a*. Also, the interconnecting portion **25** of the first slide member **21** and the abutment portion **27** are exposed to the front side of the outer housing **5**.

Referring back to FIG. **1**, when the slider **4** is mounted in the slider receiving portion **11**, the first retaining portions **15** of the outer housing **5** are engaged respectively with the second retaining portions **16***a* of the second slide member **22**, thereby preventing the second slide member **22** from moving toward the rear end (right end in the drawings) of the slider receiving portion **11**. Each stopper projection **30** of the first slide member **21** supports that portion of a lower surface (in the drawings) of the corresponding first engagement arm **16** (of the second slide member **22**) facing away from the second retaining portion **16***a,* thereby preventing the engagement of the first retaining portion **15** with the second retaining portion **16***a* from being accidentally canceled. Here, the stopper projection **30** abuts against that portion of the first engagement arm **16** disposed in the vicinity of an extension line of the area of engagement between the first retaining portion **15** and the second retaining portion **16***a*.

The second slide member **22** has a second engagement arm **33** of an elastic nature formed below (in the drawings) the operating portion **32**. The second engagement arm **33** serves to prevent the withdrawal of the slider **4** mounted in the slider receiving portion **11**, and has a third retaining portion **33***a* formed at a distal end thereof. The third retaining portion **33***a* is abutted against the pressing portion **8***b,* thereby preventing the withdrawal of the slider **4**.

The female connector (the other connector) **3** includes a housing **34** into which pin contacts **35** project in the connecting fitting direction. A plate-like pressing rib **26** for abutment against the abutment portion **27** of the first slide member **21** is formed upright on the housing **34**, and extends in the connector fitting direction. Engagement projections **36** are formed respectively on both sides of the pressing rib **26** at a front end thereof.

Next, the operation for fitting the male and female connectors **2** and **3** together will be described.

When the fitting operation is initiated in the condition shown in FIG. **1**, the pressing rib **26** of the female connector **3** passes through the passage notch **31***a* (see FIG. **2**) in the second slide member, and the front end of the pressing rib **26** abuts against the abutment portion **27** of the first slide member **21**. When, the fitting operation further proceeds, the pressing rib **26** pushes the first slide member **21** toward the rear end of the slider receiving portion **11**. At this time, the stopper projections **30** of the first slide member **21** are also moved toward the rear end of the slider receiving portion **11**, and therefore each stopper projection **30** ceases to support that portion of the lower surface (in the drawings) of the corresponding first engagement arm **16** (of the second slide member **22**) facing away from the second retaining portion **16***a,* as shown in FIG. **4**.

Also, at this time, the engagement projections **36**, formed at the front end of the pressing rib **26**, are brought into sliding contact with slanting surfaces of the housing locks **8***a,* formed respectively at the distal ends of the lock arms **8**, respectively, so that the distal end portions of the lock arms **8** are elastically deformed toward the housing **34** of the female connector **3** (that is, downwardly in the drawings). As a result, the retaining portions **31** of the second slide member **22** are engaged respectively with the distal ends of the housing locks **8**, thereby preventing the second slide member **22** from moving toward the rear end of the slider receiving portion **11**, as shown in FIG. **4**. On the other hand, the first slide member **21** is pushed toward the rear end of the slider receiving portion **11**. Thus, the first slide member **21** is moved while the second slide member **22** is stopped, and therefore the compression springs **23** (see FIG. **1**) in the second slide member **22** are compressed, and a restoring force for resiliently restoring the compression spring **23** into its original condition is produced in each compression spring **23**. If the fitting operation is stopped in a half-fitted condition, the first slide member **21** and the female connector **3** are pushed back in a disengaging direction (opposite to the fitting direction) by the restoring force of the compression springs **23**. Therefore, the half-fitted condition can be easily detected.

Then, when the fitting operation further proceeds, a rear end **25***a* (serving as engagement canceling means) of an upper wall of the interconnecting portion **25** of the first slide member **21** slides over slanting surfaces **16***b* formed respectively at the front ends of the second retaining portions **16***a*. As a result, the distal end portions of the first engagement arms **16** are elastically deformed downwardly as shown in FIG. **5**, and the second retaining portions **16***a* are inserted into the slide groove **29**. Then, the engagement of each second retaining portion **16***a* with the corresponding first retaining portion **15** is canceled.

When the fitting operation further proceeds, the engagement projections **36** slide respectively past the housing locks **8***a,* so that the lock arms **8** are elastically restored into their original shape, as shown in FIG. **6**. As a result, the engagement of the distal end of each housing lock **8***a* with the retaining portion **31** is canceled, so that the housing lock **8***a* is engaged with the rear end of the engagement projection **36**. Also, the engagement of each first retaining portion **15** with the corresponding second retaining portion **16***a* is completely canceled, so that the whole of the slider **4** is moved toward the rear end of the slider receiving portion **11** by the restoring force of the compression springs **23**. As a result, the male connector **2** and the female connector **3** are completely fitted together, and the contacts in the male connector are completely electrically connected respectively to the contacts in the female connector.

Next, the operation for canceling the fitted condition of the male and female connectors **2** and **3** will be described.

For canceling the fitted condition, the operating portion **32**, shown in FIG. **6**, is pushed toward the front end (left end in the drawings) of the slider receiving portion **11** by the finger or other against the bias of the compression springs **23**. As a result, the slanting slide surface **16***b* of each second retaining portion **16***a* slides on a similarly-slanting slide surface **15***a* of the corresponding first retaining portion **15**. At this time, each first engagement arm **16** of the second slide member **22** is easily elastically deformed since that portion of the lower surface (in the drawings) of the first engagement arm **16**, facing away from the second retaining portion **16***a,* is not supported by the stopper projection **30**, and therefore the second retaining portion **16***a* slides past the

first retaining portion **15**, as shown in FIG. **7**. Also, the third retaining portion **33***a* of the second engagement arm **33** slides over the pressing portion **8***b* of the lock arms **8**, so that the lock arms **8** are elastically deformed downwardly (in the drawings), and therefore the engagement of the housing lock **8***a* (formed at the distal end of each lock arm **8**) with the corresponding engagement projection **36** is canceled. At this time, the first slide member **21** is pushed back toward the front end of the slider receiving portion **11** by the restoring force of the compressed compression springs **23**. As a result, the female connector **3** is pushed back in the disengaging direction.

In the connector fitting structure **1**, when the slider **4** is disposed in its initial position where the second retaining portions **16***a* of the second slide member **22** are retained respectively by the first retaining portions **15** of the male connector **2** before the operation for fitting the male and female connectors **2** and **3** together is started, each stopper projection **30** of the first slide member **21** prevents the cancellation of the engagement of the first retaining portion **15** with the second retaining portion **16***a*. Therefore, the second slide member **22** can be positively prevented from being moved by vibrations or other before starting the fitting operation, and therefore it is not necessary to push the second slide member **22** back to its initial position, and the fitting operation can be carried out easily and rapidly.

When canceling the fitted condition, each first engagement arm **16** of the second slide member **22** is easily elastically deformed since that portion of the lower surface of the first engagement arm **16**, facing away from the second retaining portion **16***a*, is not supported by the stopper projection **30**, and the engagement of each first retaining portion **15** with the second retaining portion **16***a* can be smoothly canceled. Therefore, the operation for canceling the fitted condition can be effected easily.

The present invention is not limited to the above embodiment, but suitable modifications and improvements can be made.

For example, in the above embodiment, although the stoppers are defined by the projections (stopper projections) **30**, respectively, these stoppers may have any other suitable form in so far as they perform a stopper function. Although the slider **4** is received in the male connector **2**, it can be received in the female connector **3**. Although there are provided the two lock arms **8** and the two first engagement arms **16**, there may be provided one lock arm and one first engagement arm.

As described above, in the present invention, when the slider is disposed in its initial position that the second retaining portions of the second slide member are retained respectively by the first retaining portions of the one connector before the operation for fitting the male and female connectors together is started, each stopper of the first slide member prevents the cancellation of the engagement of the first retaining portion with the second retaining portion. Therefore, the second slide member can be positively prevented from being moved by vibrations or other before starting the fitting operation, and therefore it is not necessary to push the second slide member back to its initial position, and the fitting operation can be carried out easily and rapidly.

What is claimed is:

1. A connector fitting structure comprising:

a first connector having an inner housing opening to a front side thereof, an outer housing covering said inner housing and a lock arm provided on said inner housing;

a second connector fitted and connected to said first connector and having an engagement projection;

a slider comprising, a first slide member for sliding within said first connector in a connector fitting direction, a second slide member engaged with a rear portion of said first slide member, and a resilient member for urging said first and second slide members away from each other;

wherein (i) before a connector fitting operation, at least one part **16***a* of said second slide member is engaged with at least one part of said first connector to thereby retain said second slide member in its initial position and a stopper means is provided on said first slide member for preventing the cancellation of the engagement between said parts of said second slide member and said first connector, and

(ii) in accordance with the connector fitting operation, said engagement projection of said second connector urges said first slider member and deforms elastically said lock arm to thereby prevent tentatively said second slide member from moving, whereby said first slide member is moved relatively to said second slide member and said first connector to thereby unlock said stopper means and disengage said engagement between said parts of said second slide member and said first connector by an abutment of a portion of said first connector with said second sliding member.

2. A connector fitting structure according to claim **1**, wherein said stopper means is provided as a projection.

3. A connector fitting structure according to claim **1**, wherein said part of said second slide member is provided as a retaining portion formed on an elastically-deformable engagement arm provided in said second slide member and said part of said first connector is provided as a retaining portion formed on said outer housing.

4. A connector fitting structure according to claim **1**, wherein said part of said first connector includes a projection provided on an inner surface of said outer housing.

5. A connector fitting structure according to claim **1**, wherein in said initial position said resilient member is compressed by said first and second slide members.

6. A connector fitting structure according to claim **1**, wherein said part of said second slide member includes a retaining projection formed on a deformable engagement arm and wherein said stopper means abuts against said deformable engagement arm.

7. A connector fitting structure according to claim **6**, wherein stopper means includes a projection.

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